IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of
TAKESHI MATSUMOTO ET AL
Serial No. 10/535,511 Group Art Unit: 1755
Filed: May 18, 2005 Examiner: Wood, Elizabeth D
Title: EXHAUST GAS PURIFYING CATALYST AND PROCESS FOR PURIFYING EXHAUST OF GAS

DECLARATION
UNDER 37 C.F.R. 1.132

Being duly sworn, I, Takuji Nakane, a citizen of Japan, residing at 344-1-706, Waku, Aboshi-ku, Himeji-shi, Hyogo-ken, Japan, depose and say:

I. I am one of co-inventors in the above referenced application, and a chemist as well as a Researcher of AC Research Laboratory of ICT CO., LTD., one of co-assignees of this application, on the subject matters relating to this application.

I graduated from Tokyo Institute of Technology, Faculty of Science, Department of Chemistry in March 1997 and Graduate School of Tokyo Institute of Technology, Department of Chemistry in March 1999, and obtained a master degree majoring chemistry.

From April, 1999 up till the present, I have been the employee of ICT CO., LTD. at AC Research Laboratory of this company, I have been engaged in the research work with respect to catalysts for purifying exhaust gas of diesel engine.

I am well acquainted with all of the co-inventors in this case, having worked with them on the development thereof,

well as my own.

II. In order to compare the effects of the catalysts of the above-identified Matsumoto et al application Serial No. 10/535,511 with those catalysts of JP07-289910, JP05-220403 and EP 0415410, I made the experiments as follows:

Example 6

A similar method to Example 1 of Matsumoto et al (USSN 10/535,511) is carried out except that, 211g of ZSM5 and 43g of β-zeolite (same as in Example 5 of Matsumoto et al (USSN 10/535,511)) are used instead of 250g of ZSM5. The catalyst thus obtained was supported 7g of copper oxide (CuO), 80g of ZSM5, 15g of β-zeolite and 3g of magnesium oxide (MgO) per liter of the carrier.

Example 7

The catalysts obtained in Example 1, 5 and 6 thus obtained were subjected to experiments by a similar method of Examples at a catalyst inlet temperature of 500°C to obtain NOx conversion and $SO_2$ conversion. In such case, the exhaust gas compositions before addition of the light oil were 380ppm of NOx, 60ppm of HC, 100ppm carbon dioxide and 10ppm of $SO_2$. The results are shown in Table 3.

Then, under maintaining the 2,200rpm of rotation number of the engine, open degree of the throttle of the engine was controlled, and a catalyst inlet temperature was decreased to 350°C to be stable, and then the exhaust gas before addition of the light oil was measured by a similar method at 500°C (Table 4). In such case, the exhaust gas composition before addition of light oil were 270ppm of NOX, 80ppm of HC, 100ppm

of carbon monoxide and 7ppm of $SO_2$ (Table 5).

In the condition at 350°C, light oil as a reducing agent for NOx was supplied at a position of upper stream side from the catalyst layer in a rate of 5.5 ml/min. In such case, the results were shown in Table 6.

Table 3

| | CuO | ZSM5 (MFI type zeolite) H type $SiO_2/Al_2O_3$=80 Average crystal diameter < 0.05 μm | BEA (β zeolite) $NH_4$ type $SiO_2/Al_2O_3$=25 | ZSM5:BEA | Others |
|---|---|---|---|---|---|
| Example 1 | 7 | 95 | | 1:0 | Mg 3 (as oxide) |
| Example 2 | 7 | 95 | | 1:0 | Mg 1 (as oxide) |
| Example 3 | 7 | 95 | | 1:0 | Mg 5 (as oxide) |
| Example 4 | 7 | 95 | | 1:0 | Ca 3 (as oxide) |
| Example 5 | 7 | 70 | 25 | 14:5 | Mg 3 (as oxide) |
| Example 6 | 7 | 80 | 15 | 16:3 | Mg 3 (as oxide) |
| Control 1 | 7 | 95 | | 1:0 | |

Table 4 (at 500°C)

| | NOx conversion | $SO_2$ conversion |
|---|---|---|
| Example 1 | 18 | 22 |
| Example 2 | 16 | 41 |
| Example 3 | 16 | 15 |
| Example 4 | 16 | 33 |
| Example 5 | 17 | 24 |
| Control 1 | 16 | 60 |

Table 5 (at 500°C)

| | NOx conversion | $SO_2$ conversion |
|---|---|---|
| Example 1 | 17 | 14 |
| Example 5 | 17 | 17 |
| Example 6 | 16 | 15 |

Table 6 (at 350°C)

| | NOx conversion | $SO_2$ conversion |
|---|---|---|
| Example 1 | 14 | 0 |
| Example 5 | 23 | 0 |
| Example 6 | 20 | 1 |

III. CONCLUSION

As being clear from the above-mentioned examples, the effect of a mixture of ZSM5 with β-zeolite in a specific ratios resides in widen the windows of NOx conversion.

The undersigned Takuji Nakane declared that all the statements made herein are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardized the validity of the application or any patent issuing thereon.

Dated this 18th day of September, 2007.

By Takuji Nakane

Takuji Nakane